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EL 964692873 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:
Douglas W. Akers

Serial No.: 09/932,531

Filing Date: 08/17/2001

For: APPARATUS FOR PHOTON ACTIVATION POSITRON ANNIHILATION ANALYSIS

Docket No.: B-124

Confirmation No.: 4276

Examiner: R. J. Palabrica

Group Art Unit: 3641

ASSISTANT COMMISSIONER FOR PATENTS
PO Box 1450
Alexandria, VA 22313-1450

Transmittal of Appeal Brief

Sir:

Transmitted herewith in triplicate is the Appeal Brief in this application with respect to the Notice Appeal filed on February 13, 2004.

The fee for filing this Appeal Brief is (37 CFR 1.17 (c)) $330.00.

Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

A check No. 5231 in the amount of $330.00 to cover this Appeal Brief is enclosed. At any time during the pendency of this application, charge any fees required or credit any overpayment to Deposit Account No. 50-0982 pursuant to 37 CFR 1.25. A duplicate copy of this transmittal letter is enclosed.

Respectfully submitted,

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Date: 4-12-04

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CERTIFICATE OF EXPRESS MAILING

I hereby certify that the attached **Transmittal of Appeal Brief (in duplicate); Check No. 5231 ($330.00); Appeal Brief in triplicate (a total of 75 pages including Appendices); and Post card for return by the United States Patent and Trademark Office,** are all being deposited with the United States Postal Service addressed to the Commissioner for Patents, Mail Stop Appeal Brief-Patents, P.O. Box 1450, Alexandria, VA 22313-1450, via Express Mail No. EL 964692873 US, on this 12th day of April 2004.

By: [signature]
Bruce E. Dahl, Reg. No. 33,670

EL964692873US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of:	)	
	)	
AKERS, Douglas, W.	)	Examiner: Palabrica, R.J.
	)	
Serial No. 09/932,531	)	
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	)	
Atty Dkt: B-124	)	

APPEAL BRIEF

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APPEAL BRIEF

To: Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted in response to the final rejections of the claims dated November 17, 2003. A Notice of Appeal was filed on February 13, 2004.

REAL PARTY-IN-INTEREST

The assignee of the entire right, title, and interest in the patent application is Bechtel BWXT Idaho, LLC.

RELATED APPEALS AND INTERFERENCES

There is a related appeal of another United States patent application, serial no.

10/269,807, filed October 10, 2003, that may directly affect, or be directly affected by, or have a bearing on, the Board's decision. Application serial no. 10/269,807 is a divisional application of the application that is the subject of this appeal. There are currently no related interferences known to Appellant, Appellant's legal representative, or the assignee which will directly affect, or be directly affected by, or have a bearing on, the Board's decision.

STATUS OF THE CLAIMS

Claims 1-5, 7, 8, 20-24, 26-28, and 30-36 are pending in the application. Claim 4 is withdrawn from consideration. Claims 1-3, 5, 7, 8, 20-24, 26-28, and 30-36 currently stand rejected. The rejections of claims 1-3, 5, 7, 8, 20-24, 26-28, and 30-36 are appealed.

STATUS OF AMENDMENTS

No amendments were filed or entered subsequent to the final office action mailed on November 17, 2003.

SUMMARY OF INVENTION

The present invention is directed to apparatus for performing non-destructive testing of materials using positron annihilation. The invention as claimed is summarized below with reference to the independent claims which contain reference numerals and reference to the specification and drawings. All references are shown in the application at least where indicated herein.

(Claim 1) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

a photon source (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37), said photon source (12) producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having a predetermined energy and directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested, the photons (16) from said photon source (12) resulting in the creation of positrons within the specimen (18) being tested;

a detector (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40), said detector (14) positioned adjacent the specimen (18) being tested so that said detector (14) detects gamma rays (20, Figures 1 and 5, ¶¶ 19, 20, 24-26, 38-40, and 50-54) produced by annihilation of positrons with electrons; and

a data processing system (24, Figure 1, ¶¶ 19, 20, and 41-43), operatively associated with said detector (14), said data processing system (24) producing output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of the presence or absence of a lattice defect in the specimen (18) being tested.

(Claim 8) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

photon generating means (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37) for producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having predetermined energies and for directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested, the photons (16) from said photon generating means (12) resulting in the creation of positrons within the specimen (18) being tested;

detecting means (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) for detecting gamma rays (20, Figures 1 and 5, ¶¶ 19, 20, 24-26, 38-40, and 50-54) produced by annihilation of positrons with electrons within the specimen (18) being tested and for producing an

output (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) indicative of a material characteristic of the specimen (18) being tested; and

data processing means (24, Figure 1, ¶¶ 19, 20, and 41-43) operatively associated with said detecting means (14) for producing output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of the presence or absence of a lattice defect in the specimen (18) being tested.

(Claim 20) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

a photon source (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37), said photon source (12) producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having a predetermined energy and directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested, the photons (16) from said photon source (12) resulting in the creation of positrons within the specimen (18) being tested;

a detector (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) positioned adjacent the specimen (18) being tested, said detector (14) producing raw data (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) indicative of a positron annihilation event; and

a data processing system (24, Figure 1, ¶¶ 19, 20, and 41-43) operatively associated with said detector (14) and said photon source (12), said data processing system (24) operating in accordance with a normal activation/analysis process (38, Figures 2 and 3, ¶¶ 22-24 and 48-50) when a half-life of a selected positron emitter within the specimen (18) being tested is greater than a predetermined half-life, said data processing system (24) operating in accordance with a rapid activation/analysis process (40, Figures 2 and 4, ¶¶ 22, 25, 26, 48, and 51-54) when a half-life of the selected positron emitter within

the specimen (18) being tested is less than the predetermined half-life, said data processing system (24), when operated in accordance with the rapid activation/analysis process (40), alternatively activating said photon source (12) and detecting raw data (22) indicative of a positron annihilation event, said data processing system (24) including a Doppler broadening algorithm (62, Figure 6, ¶¶ 27-30, 55, 56, 58, and 60), said Doppler broadening algorithm (62) processing raw data (22) indicative of a positron annihilation event to produce output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of the presence or absence of a lattice defect in the specimen (18) being tested.

(Claim 26) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

positron activation means (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37) for activating a positron emitter within a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested;

detector means (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) for detecting a positron annihilation event within the specimen (18) being tested and for producing raw data (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) indicative of the positron annihilation event;

means for alternately activating (40, Figures 2 and 4, ¶¶ 22, 25, 26, 48, and 51-54) the positron emitter within the specimen (18) being tested and detecting a positron annihilation event; and

data processing means (24, Figure 1, ¶¶ 19, 20, and 41-43) operatively associated with said detector means (14), said data processing means (24) processing raw data (22) indicative of the positron annihilation event in accordance with a Doppler broadening algorithm (62, Figure 6, ¶¶ 27-30, 55, 56, 58, and 60) to produce output data (26, Figure

1, ¶¶ 19, 20, and 41-43) indicative of the presence or absence of a lattice defect in the specimen (18) being tested.

(Claim 31) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

a photon source (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37), said photon source (12) producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having a predetermined energy and directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested, the photons (16) from said photon source (18) resulting in the creation of positrons within the specimen (18) being tested;

a detector (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) positioned adjacent the specimen (18) being tested, said detector (14) producing raw data (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) related to a positron annihilation event; and

a Doppler broadening processor (62, Figure 6, ¶¶ 27-30, 55, 56, 58, and 60) operatively associated with said detector (14) and responsive to the raw data (22) produced thereby, said Doppler broadening processor (62) producing output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of the presence or absence of a lattice defect in the specimen (18) being tested.

(Claim 34) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

a photon source (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37), said photon source (12) producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having a predetermined energy and directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30,

34, 39-46, and 50-60) being tested, the photons (16) from said photon source (12) resulting in the creation of positrons within the specimen (18) being tested;

a detector (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) positioned adjacent the specimen (18) being tested, said detector (14) producing raw data (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) indicative of a positron formation event and a positron annihilation event; and

a positron lifetime processor (64, Figure 6, ¶¶ 27-30, 55, 57, and 60) operatively associated with said detector (14) and responsive to the raw data (22) produced thereby, said positron lifetime processor (64) producing output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of a the presence or absence of a lattice defect in the specimen (18) being tested and indicative of a changing presence or absence of a lattice defect.

(Claim 36) Non-destructive testing apparatus (10, Figure 1, ¶¶ 19, 20, and 34-45), comprising:

a photon source (12, Figures 1 and 5, ¶¶ 19, 20, and 34-37), said photon source (12) producing photons (16, Figures 1 and 5, ¶¶ 19, 20, and 34-37) having a predetermined energy and directing the photons (16) toward a specimen (18, Figures 1 and 5, ¶¶ 19-30, 34, 39-46, and 50-60) being tested, the photons (16) from said photon source (12) resulting in the creation of positrons within the specimen (18) being tested;

a detector (14, Figures 1 and 5 ¶¶ 19, 20, and 38-40) positioned adjacent the specimen (18) being tested, said detector (14) producing raw data (22, Figure 1, ¶¶ 19, 24, 27-29, 41, 50, and 55) indicative of a positron formation event and a positron annihilation event; and

a data processing system (24, Figure 1, ¶¶ 19, 20, and 41-43) operatively associated

with said detector (14), said data processing system (24) including:

a Doppler broadening algorithm (62, Figure 6, ¶¶ 27-30, 55, 56, 58, and 60), said Doppler broadening algorithm (62) processing raw data (22) indicative of a positron annihilation event to produce output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of a presence or absence of a lattice defect in the specimen (18) being tested;

a positron lifetime algorithm (64, Figure 6, ¶¶ 27-30, 55, 57, and 60), said positron lifetime algorithm (64) processing raw data (22) indicative of a positron formation event to produce output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of a changing presence or absence of a lattice defect; and

a three-dimensional imaging algorithm (66, Figure 6, ¶¶ 27-30, 55, and 58-60), said three-dimensional imaging algorithm (66) processing raw data (22) indicative of a positron annihilation event to produce output data (26, Figure 1, ¶¶ 19, 20, and 41-43) indicative of a location of the presence or absence of a lattice defect within the specimen (18) being tested.

ISSUES

1. Whether claims 26-28 are unpatentable under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

2. Whether claims 26-28 are unpatentable under 35 U.S.C. §112, second paragraph, as being indefinite.

3. Whether claims 1-3, 5, 7, and 8 are unpatentable under 35 U.S.C. §103(a) as being obvious over either of Akers *et al.*, U.S. Patent No. 6,178,218 (Akers) in view of Firestone.

4. Whether claims 20-24, 26-28, and 30-36 are unpatentable under 35 U.S.C. §103(a)

as being obvious Akers and Firestone, in view of applicant's own admission of prior art.

GROUPING OF THE CLAIMS

As among the rejections, none of the claims stand or fall together. Each claim is independently patentable as set forth in the ARGUMENT. As for each rejection, with respect to the Section 112 rejections, claims 27 and 28 stand or fall with claim 26. With respect to the obviousness rejections of claims 1-3, 5, 7, and 8, claims 2, 3, 5, and 8 stand or fall with claim 1. Claim 7 is independently patentable as set forth in the ARGUMENT. With respect to the obviousness rejections of claims 20-24, 26-28, and 30-36, claim 31 stands or falls with claim 20. Claims 21-24, 26-28, 30, and 32-36 are independently patentable as set forth in the ARGUMENT.

ARGUMENT

Opening Statement

The examiner has failed to establish the required *prima-facie* case that the claims are not enabled. Therefore, claims 26-28 are presumed to meet the enablement requirement. With regard to the Section 112, second paragraph, rejections, the claim term in question is sufficiently definite to a person having ordinary skill in the art, thus satisfying the requirements of Section 112, second paragraph. The examiner's obviousness rejections under Section 103 cannot stand as the examiner failed to establish the required *prima-facie* case of obviousness. Therefore, claims 1-3, 5, 7, 8, 20-24, 26-28, and 30-36 are allowable.

ISSUE 1: Whether claims 26-28 are unpatentable under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

Legal Standard For Rejecting Claims Under 35 U.S.C. §112, first paragraph

The legal standard for determining whether the disclosure provides a sufficient description of the invention is whether a person reasonably skilled in the art could make or use the invention without undue experimentation based on the disclosure and on information known in the art. *United States v. Telectronics, Inc.*, 857 F.2d 778, 8 USPQ2d 1217 (Fed. Cir. 1988). The fact that experimentation may be complex does not necessarily make it undue if the art typically engages in such experimentation. *In re Wands*, 858 F.2d 731, 8 USPQ2d 1400 (Fed. Cir. 1988). That is, the test of enablement is not whether any experimentation is required, but whether, if experimentation is necessary, it is undue. *In re Angstadt*, 537 F.2d 498, 190 USPQ 214 (CCPA 1976).

The factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue" include, but are not limited to: The breadth of the claims; the nature of the invention; the state of the prior art; the level of one of ordinary skill; the level of predictability in the art; the amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation needed to make or use the invention based on the content of the disclosure. See, for example, MPEP 2164.01(a). It is improper to conclude that a disclosure is not enabling based on an analysis of only one of the above factors while ignoring one or more of the others. MPEP 2164.01(a).

With regard to the burden of proof required to support a rejection under Section 112, the Patent Office is required to assume that the specification complies with the enablement provision of Section 112 unless it has acceptable evidence or reasoning to suggest otherwise. See, for example, *In re Marzocchi*, 439 F.2d 220, 169 USPQ 367 (CCPA 1979). The Patent Office thus

must provide reasons, supported by the record as a whole, why the specification is not enabling. Then and only then does the burden shift to the applicant to show that one of ordinary skill in the art could have practiced the claimed invention without undue experimentation. *Gould v. Missinghoff*, 229 USPQ 1 (D.D.C. 1985), *aff'd in part, vacated in part, and remanded sub. nom., Gould v. Quigg*, 822 F.2d 1074, 3 USPQ2d 1302 (Fed. Cir. 1987). Mere conclusionary statements as to the level of ordinary skill in the art are not a sufficient basis for a rejection under 35 U.S.C. §112. *In re Brebner*, 455 F.2d 1402, 173 USPQ 169 (CCPA 1972). In addition, the law does not require, and indeed prefers, that a patent specification omit that which is well-known. *In re Buchner*, 929 F.2d 660, 18 USPQ2d 1331 (Fed. Cir. 1991).

The Examiner's Rejections

The examiner rejected claims 26-28 under Section 112, first paragraph, as containing subject matter that is not sufficiently described by the specification. The examiner's rejections are improper in that the Patent Office has failed to meet is burden of proof as to why the disclosure is insufficient.

The examiner's Section 112 rejections of these claims have only appeared late in the prosecution. Claims 26-28 were first added in Appellant's response (dated July 25, 2002) to the first office action issued by the examiner. In the final office action response, issued September 18, 2002, the examiner did not reject these claims under Section 112. Indeed, the examiner's first two office actions made no Section 112 rejections at all, even though both office actions considered some or all of the claims currently on appeal. Only after the examiner withdrew the final office action of September 18, 2002 (at the request of the Appellant as being improperly under "final"), did the examiner start objecting to the specification and claims under Section 112.

With regard to the Section 112 rejections as they now stand, Appellant's understanding

is that the examiner takes issue with the claim language "means for activating a positron emitter," stating that it is a precursor that is activated. See, page 2 of the final office action, dated November 17, 2003. While the examiner's definition of "activate" also may be generally correct, Appellant has chosen to define the term "activate" as specifically set forth in the detailed description. Appellant's definition is consistent with the manner in which persons having ordinary skill in the art commonly refer to the process of bombarding a stable atom with energy in order to create an unstable isotope or positron emitter that subsequently decays by emitting a positron as "activation" or "activation of a positron source." Indeed, the U.S. Patent Office has specifically allowed this type of description in several U.S. patents. Therefore, Appellant's use of the term "positron emitter" and reference to "activation" of a positron emitter satisfies the requirements of Section 112.

Initially, Appellant notes that the terms "activate" and "activation" are defined by the McGraw-Hill Dictionary of Scientific and Technical Terms, Fifth Edition, as follows:

> "activate. . .[nucleo] To induce radioactivity through bombardment by neutrons or by other types of radiation."
>
> "activation. . .[nucleo] The process of inducing radioactivity by bombardment with neutrons or with other types of radiation."

The use of the terms "activate" or "activation" in conjunction with the term "positron emitter" refers to the inducement of radioactivity by bombardment with neutrons or other types of radiation. The use of the term "activation" in this way is not contrary to its normal meaning in this field. The positron emitter is the radioactive element. Thus, a "positron emitter" is formed or "activated" by bombardment with neutrons or other types of radiation.

The pending application describes the process in exactly this way. For example, paragraph [0044] states: "A list of positron emitters, the threshold gamma ray energies required

to **form or 'activate'** the positron emitters, as well as their half-lives are presented herein as Tables I and II." (emphasis added). The written description therefore defines the term "activate" as synonymous with the term "form." Appellant's selected definition of "activate" is consistent with the ordinary meaning of that term as understood by those having ordinary skill in the art.

Appellant notes also that several U.S. patents of record talk about positron emitters as unstable isotopes that can be "activated." For example, U.S. Patent No. 4,980,901 to Miller states as follows:

> "The photons are produced from the nitrogen atoms in the object 18 as a result of the activation of the nuclei of the nitrogen atoms by x-rays from the source 12. The **activated nuclei of the nitrogen atoms then decay** with a half life of approximately ten (10) minutes by isotropically emitting positrons." Col. 3, lines 47-52 (emphasis added).

The "activated nuclei" that decay are ^{13}N, which are positron emitters. Therefore, Miller is effectively referring to "activated positron emitters."

U.S. Patent No. 5,175,756 to Pongratz uses nearly identical language:

> "The half-life of **activated nitrogen atoms (^{13}N)** is approximately 10 minutes, which is sufficiently long to permit X-ray examination of the luggage. . ." Col. 3, lines 38-40. (emphasis added).

Again, because ^{13}N is a positron emitter, the cited language of Pongratz also effectively refers to "activated positron emitters."

In addition, Appellant himself has used the same language in an issued U.S. patent. Specifically, U.S. Patent No. 6,178,218 to Akers states as follows:

> "Another neutron **activated positron source** formed within a metal test specimen is ^{58}Co, which is formed by in situ neutron capture from ^{59}Co within the metal." (emphasis added).

Akers directly refers to an "activated" positron source (i.e., positron emitter). Even more significantly, the claim language of Akers uses the term "positron emitter" in nearly the same

manner as the pending claims. More specifically, claims 1 and 10 of Akers both state:

"(a) providing a metal specimen having **a positron emitter source therein**;

(b) **activating the positron emitter source** by neutron activation. . ." (emphasis added).

Clearly, then, persons having ordinary skill in the art regard "positron emitters" as being "activated" or capable of being "activated." Stated another way, persons having ordinary skill in the art would readily understand the meaning of the term "positron emitter" as it is used in the present application as well the reference to a "positron emitter" as something that can be "activated" (i.e., formed) as the result of bombardment. Any doubt as to the meaning of "activated" in the context of the present application is erased by reference to the specification which defines "activated" as "formed." Because persons having ordinary skill in the art use the terms in these ways, the claim terms at issue are sufficiently enabling and definite under Section 112 as a matter of law.

In addition, the U.S. Patent and Trademark Office has specifically allowed the use of these terms in these ways. The patents to Miller and Pongratz refer to "activated" ^{13}N. Because ^{13}N is a positron emitter, Miller and Pongratz effectively refer to an "activated positron emitter." The patent to Akers utilizes the term "activated positron source." The claims of the Akers patent also refer to a specimen having "a positron emitter source therein" and also specifically refer to "activating the positron emitter source." Accordingly, because the Patent Office has previously allowed the use of these terms in this way, Appellant's use of these terms in this way is sufficiently enabling and definite under Section 112.

Appellant notes that MPEP 2173.02 "Clarity and Precision" specifically states as follows:

"The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph is whether the claim meets the threshold requirements of clarity and precision, **not whether more suitable language or modes of expression are available.**" (emphasis added).

In addition, Section 2173.02 goes on to state that examiners:

> ". . .**should not reject claims or insist on their own preferences** if other modes of expression selected by applicants satisfy the statutory requirement." (emphasis added).

Accordingly, the fact that there may be other language or modes of expression available cannot be used to support a rejection under Section 112 so long as the language used meets the threshold requirements of clarity and precision. Moreover, the examiner should not have rejected claims or insisted on his own preferences, again so long as the requirements of Section 112 are met, which they are here. Because persons having ordinary skill in the art describe a "positron emitter" as something that can be "activated," Appellant's use of these terms in the same way in the pending application *prima-facie* meets the requirements of clarity and precision required by Section 112.

Finally, the Court of Appeals for the Federal Circuit has ruled that the inventor's definition and explanation of the meaning of a word, as evidenced by the specification, controls the interpretation of that claim term, even over a dictionary definition. See, *Serrano v. Telular Corp.*, 111 F.3d 1578, 42 USPQ2d 1538 (Fed. Cir. 1997); adopting the definition in the specification, despite the fact that "Serrano's proposed dictionary definition thus is inconsistent with the specification." *Serrano, supra,* at 1582.

The term "positron emitter" and reference to the "activation" of a positron emitter as used in the currently-pending claims means that bombardment of the specimen with gamma rays of the appropriate energy will result in the formation (i.e., activation) of an isotope that emits positrons (i.e., a positron emitter). This phenomenon is discussed at length in the specification. The examiner's re-definition of the term "positron emitter" or assertion that it is a precursor that is "activated" not a "positron emitter" is contrary to the meaning assigned to it by the inventor and

by persons having ordinary skill in the art (as evidenced by the Miller, Pongratz, and Akers patents). Using the definition of the specification illustrates the flaw in the examiner's rationale. Substituting "formed" for "activated" as directed by the specification, under the examiner's rationale, the precursor would be "activated" or "formed" by photon bombardment. That is not correct. The precursor exists as an element in a stable form. What is "formed" by photon bombardment is the positron emitter. Moreover, these patents are evidence that the U.S. Patent and Trademark Office has previously regarded such language and usage to be sufficiently definite under Section 112.

In summation, then, Appellant's use of the term "positron emitter" as something that can be "activated" is sufficiently enabling and definite as a matter of law. Appellant's use of these terms as defined in the specification is consistent with the normal meanings of these terms. Indeed, these terms are used in the exact same way by persons having ordinary skill in the art. The U.S. Patent and Trademark Office has already found such language and usage to be sufficiently definite under Section 112, as it appears repeatedly in issued patents. Accordingly, Appellant requests the Board to reverse the rejections of claims 26-28.

ISSUE 2: Whether claims 26-28 are unpatentable under 35 U.S.C. §112, second paragraph, as being indefinite.

<u>Legal Standard For Rejecting Claims</u>
<u>Under 35 U.S.C. §112, second paragraph</u>

The test for definiteness of claim language is whether a person having ordinary skill in the art would understand the bounds of the claim when read in light of the specification, and the degree of precision necessary for adequate claims depends on the nature of the subject matter. *Miles Laboratories, Inc., v. Shandon, Inc.*, 27 USPQ2d 1123 (Fed. Cir. 1993).

The Examiner's Rejections:

The examiner rejected claims 26-28 under 35 U.S.C. §112, second paragraph, as indefinite for the reasons given for his Section 112, first paragraph, rejections.

In responding to this rejection, appellant hereby repeats the arguments set forth above in response to ISSUE 1. That is, not only is the term "positron emitter" described in the specification, it is used in the same manner as in the pending claims, i.e., as something that can be activated. Moreover, the term "positron emission" even appears in the dictionary. In view of these factors, it cannot be said that the term "positron emitter" is not sufficiently definite.

To sum-up, because the term "positron emitter" is discussed throughout the specification and used in the same manner as the pending claims, a person having ordinary skill in the art would readily understand the meaning of the term "positron emitter" in the context of the present application. Therefore, appellant respectfully requests the Board to reverse the examiner's rejections of claims 26-28 under Section 112, second paragraph.

ISSUE 3: Whether claims 1-3, 5, 7, and 8 are unpatentable under 35 U.S.C. §103(a) as being obvious over either of Akers *et al.*, U.S. Patent No. 6,178,218 (Akers) in view of Firestone.

Legal Standard For Rejecting Claims
Under 35 U.S.C. §103

The test for obviousness under 35 U.S.C. §103 is whether the claimed invention would have been obvious to those skilled in the art in light of the knowledge made available by the reference or references. *In re Donovan*, 184 USPQ 414, 420, n. 3 (CCPA 1975). It requires consideration of the entirety of the disclosures of the references. *In re Rinehart*, 189 USPQ 143, 146 (CCPA 1976). All limitations of the claims must be considered. *In re Boe*, 184 USPQ 38,

40 (CCPA 1974). In making a determination as to obviousness, the references must be read without benefit of applicant's teachings. *In re Meng*, 181 USPQ 94, 97 (CCPA 1974). In addition, the propriety of a Section 103 rejection is to be determined by whether the reference teachings appear to be sufficient for one of ordinary skill in the relevant art having the references before him to make the proposed substitution, combination, or other modifications. *In re Lintner*, 173 USPQ 560, 562 (CCPA 1972).

A basic mandate inherent in Section 103 is that a piecemeal reconstruction of prior art patents shall not be the basis for a holding of obviousness. It is impermissible within the framework of Section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. *In re Kamm*, 172 USPQ 298, 301-302 (CCPA 1972). Put somewhat differently, the fact that the inventions of the references and of the applicant may be directed to concepts for solving the same problem does not serve as a basis for arbitrarily choosing elements from references to attempt to fashion applicant's claimed invention. *In re Donovan, supra*, at 420.

In the case of *In re Wright*, 6 USPQ2d 1959 (Fed. Cir. 1988) (restricted on other grounds by *In re Dillon*, 16 USPQ2d 1897 (Fed. Cir. 1990), the Court of Appeals for the Federal Circuit decided that the Patent Office had improperly combined references which did not suggest the properties and results of the applicants' invention nor suggest the claimed combination as a solution to the problem which applicants' invention solved. The CAFC reached this conclusion after an analysis of the prior case law, at p. 1961:

> "We repeat the mandate of 35 U.S.C.§ 103: it is the invention as a whole that must be considered in obviousness determinations. The invention as a whole embraces the structure, its properties, and the problem it solves. See, e.g., *Cable Electric Products, Inc. v. Genmark, Inc.*, 770 F.2d 1015, 1025, 226 USPQ 881, 886 (Fed. Cir. 1985) ("In evaluating obviousness, the hypothetical person of

ordinary skill in the pertinent art is presumed to have the 'ability to select and utilize knowledge from other arts reasonably pertinent to [the] particular problem' to which the invention is directed"), quoting *In re Angle*, 444 F.2d 1168, 1171-72, 170 USPQ 285, 287-88 (CCPA 1971); *In re Antonie*, 559 F.2d 618, 619, 195 USPQ 6, 8 (CCPA 1977) ("In delineating the invention as a whole, we look not only at the claim in question... but also to those properties of the subject matter which are inherent in the subject matter **and** are disclosed in the Specification") (emphasis in original).

The determination of whether a novel structure is or is not "obvious" requires cognizance of the properties of that structure and the problem which it solves, viewed in light of the teachings of the prior art. See, e.g., *In re Rinehart*, 531 F.2d 1048, 1054, 189 USPQ 143, 149 (CCPA 1976) (the particular problem facing the inventor must be considered in determining obviousness); see also *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984) (it is error to focus "solely on the product created, rather than on the obviousness or notoriousness of its creation") (quoting *General Motors Corp. v. U.S. Int'l Trade Comm'n*, 687 F.2d 476, 483, 215 USPQ 484, 489 (CCPA 1982), cert. denied, 459 U.S. 1105 (1983).

Thus the question is whether what the inventor did would have been obvious to one of ordinary skill in the art attempting to solve the problem upon which the inventor was working. *Rinehart*, 531 F.2d at 1054, 189 USPQ at 149; see also *In re Benno*, 768 F.2d 1340, 1345, 226 USPQ 683, 687 (Fed. Cir. 1985) ("appellant's problem" and the prior art present different problems requiring different solutions")."

More recently, the CAFC has reiterated the necessity that motivation be identified in choosing to combine prior art references for an obviousness type rejection. As stated by the Court of Appeals for the Federal Circuit in *In re Rouffet*, 47 USPQ2d 1453 (Fed. Cir. 1998) at 1457:

"[V]irtually all [inventions] are combinations of old elements." *Environmental Designs, Ltd. V. Union Oil Co.,* 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed.Cir. 1983)("Most, if not all, inventions are combinations and mostly of old elements."). Therefore an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed.Cir. 1996).

To prevent the use of hindsight based on the invention to defeat patentability

> of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed."

A reference which teaches away from the applicant's invention may not properly be used in framing a 35 U.S.C. §103 rejection of applicant's claims. See *United States v. Adams*, 148 USPQ 429 (1966).

The Examiner's Rejections

The examiner rejected claims 1-3, 5, 7, and 8 under 35 U.S.C. §103(a) as being unpatentable over Akers in view of Firestone. These rejections fail because the examiner has failed to establish the required *prima-facie* case of obviousness. In addition, neither reference contains the suggestion or incentive required to combine the references in the manner urged by the examiner.

The Firestone reference merely indicates that ^{62}Cu may be produced by a charged particle reaction, a photon reaction, or by fast neutron activation. However, the Firestone reference does not teach or suggest how ^{62}Cu may be used for *any* purpose, much less how ^{62}Cu may be used in non-destructive testing apparatus in the manner defined by the pending claims. Instead, the examiner's rejections are based on the mere conclusion that because Firestone discloses that ^{62}Cu may be formed or produced by a photon reaction, that it would be obvious to "modify the apparatus, as disclosed by Akers et al., by the teaching of Firestone." This is not the test for obviousness under Section 103.

The test for obviousness is not whether the various elements of the claim can be found in the prior art, but whether the prior art provides some suggestion, incentive, or motivation to a

person having ordinary skill in the art to combine those elements make the claimed combination. *In re Rouffet, supra.* The examiner can satisfy the burden of showing obviousness "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." *In re Lee*, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). This the examiner has not done. He has not pointed to any objective teachings in either Akers or Firestone that would lead an individual to combine the relevant teachings in the manner required by the rejected claims. Indeed, it is impossible to do so because Firestone is completely silent as to any possible uses of ^{62}Cu. While the Akers reference does disclose the use of ^{62}Cu, Akers forms the ^{62}Cu by neutron activation. Therefore, there is no need in Akers, thus no suggestion or incentive, to substitute neutron activation for photon activation. While the present invention does suggest the use of photon activation to form ^{62}Cu, it is well-established law that the teachings of an invention cannot be used a blueprint or guide to pick and choose from among the prior art only those aspects contained in the invention without regard to what each reference fairly teaches to persons having ordinary skill in the art. This is what the examiner has done. That is, armed with the teachings of the present invention, the examiner has searched the prior art for the various elements and limitations recited in the pending claims in a misplaced attempt to establish the obviousness of the pending claims. However, what counts is the objective teachings of the prior art. Here, there are no objective teachings in the prior art that would lead a person having ordinary skill in the art to combine the teachings of the references.

Because the examiner has failed to identify any objective teaching in either Akers or Firestone that would lead a person having ordinary skill in the art to combine the relevant teachings of the references, the examiner failed to establish the required *prima-facie* case of obviousness of claim 1. Therefore, claim 1, and the claims depending therefrom, i.e., claims 2,

3, and 5, are allowable.

Claim 7 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 7 "wherein said data processing system is operatively associated with said photon source, said data processing system operating said photon source to produce photons having predetermined energies." None of the references cited by the examiner disclose or suggest this arrangement.

Independent claim 8 is allowable for the same reasons expressed above for claim 1. That is, the examiner has failed to establish the required prima-facie case of obviousness of claim 8 by failing to identify any objective teaching in either Firestone or Akers that would lead a person having ordinary skill in the art to combine the references in the manner required by claim 8. The mere conclusory statements offered by the examiner are not enough.

ISSUE 4: Whether claims 20-24, 26-28, and 30-36 are unpatentable under 35 U.S.C. §103(a).

The Examiner's Rejections

The examiner rejected claims 20-24, 26-28, and 30-36 under 35 U.S.C. Section 103(a) as being "unpatentable over the combination of Akers et al. and Richard B. Firestone, and in view of applicant's own admission of prior art."

As a first point, Appellant would like to note that the examiner made similar rejections in the related divisional application (serial no. 10/269,807). That is, at one time the examiner rejected the claims of the divisional application based on certain features of the invention that the examiner asserted were "admitted prior art" (i.e., the rapid activation/analysis process, the normal activation/analysis process, the Doppler broadening algorithm, the positron lifetime algorithm,

and the three-dimensional algorithm). The examiner takes the same position here, i.e., that those **same** certain features are "admitted prior art." Appellant successfully challenged the examiner's position during the prosecution of the related divisional application, and the examiner removed those rejections. That is, while the examiner's rejections based on such "admitted prior art" were appealed in the divisional application, they were specifically withdrawn by the examiner in his Answer. The examiner's withdrawal of similar rejections based on the same "admitted" prior art is in the nature of a party admission, i.e., an admission that rejections based on such "admitted" prior art are without foundation and unsustainable.

In the interests of brevity, then, Appellant will not address these rejections again here, but instead specifically incorporates herein by reference the arguments previously made by the Appellant in the Appeal Brief for the related divisional application. A copy of the relevant pages (i.e., pages 19-27) of that Appeal Brief is attached hereto as Appendix C. Also attached hereto as Appendix D is a copy of the relevant page (i.e., page 2) of the examiner's Answer, wherein he specifically withdrew those rejections.

To summarize those arguments, the examiner's statements about "admitted" prior art are mis-representations of the statements contained in the referenced preliminary amendment (i.e., paper no. 14), the relevant pages (i.e., pages 8-15) of which are attached hereto as Appendix E. Appellant made no such statements. Neither the normal activation/analysis process nor the rapid activation/analysis process is prior art, and Appellant specifically denies that they are prior art.

The preliminary amendment referred to by the examiner (attached hereto as Appendix E) involves, in part, a rebuttal to Section 112 rejections made by the examiner in that case that the specification was insufficient as to what exactly is meant by the term "activation/analysis." In responding, appellant pointed out the many and various sections in the application (both specification and drawings) where the processes are described in sufficient detail to allow a

person having ordinary skill in the art to practice the invention without undue experimentation. Appellant stated that no line-by-line recitation of computer code that might be written to perform the processes was included, but that the level of ordinary skill in the art was sufficiently high so as not to require such a level of disclosure. Of course, this is in accordance with the case law and with MPEP:

> "As a general rule, where software constitutes a part of a best mode of carrying out an invention, description of such best mode is satisfied by a disclosure of the functions of the software." MPEP 2163(I)(A), quoting *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997).

It is by no means an admission that the processes themselves are prior art. Appellant specifically refers the Board to the highlighted sections contained in pages 8, line 10 through page 13, line 3 of appellant's remarks, attached hereto as part of Appendix E.

Appellant also traverses the examiner's assertions that the prior art (i.e., the positron lifetime algorithm, the Doppler broadening algorithm, and the three-dimensional imaging algorithm) admitted by appellant is sufficient to support an obviousness rejection. In responding to this point, Appellant incorporates herein by reference the arguments previously presented by Appellant on pages 14 and 15 of the preliminary amendment attached hereto as Appendix E. While these algorithms are indeed known in the art, it is not known to apply the processes in combination with the other elements of the pending claims. That knowledge stems from the present application which, of course, is not prior art. In other words, in making this statement, the examiner is improperly using the Appellant's own teachings as a blueprint to piece together prior art elements in the manner required by the pending claims. This use is improper and cannot be used to sustain an obviousness rejection under Section 103. As the Court of Appeals for the Federal Circuit stated in *In re Rouffet, supra*:

". . .rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." [citations omitted].

In summation, because none of the "admitted" prior art relied on by the examiner to support his obviousness rejections under Section 103 is in fact prior art, the examiner has failed to establish the required prima-facie case of obviousness. Therefore claims 20-24, 26-28, and 30-36 are allowable.

In addition, Appellant incorporates herein the arguments set forth above with respect to the allowability of claims 1-3, 5, 7, and 8. That is, neither Akers nor Firestone contain any objective teachings that would lead a person having ordinary skill in the art to combine them in the manner required by claim 20, nor has the examiner identified any such objective teachings. The examiner's conclusory statements are not a sufficient basis for sustaining an obviousness rejection of claim 20. That is, nothing in the prior art discloses or suggests a non-destructive testing apparatus having a data processing system that operates in accordance with a "normal activation/analysis process when a half-life of a selected positron emitter within the specimen being tested is greater than a predetermined half-life." as specifically required by claim 20. In addition, claim 20 requires that the data processing system operate in accordance with a "rapid activation/analysis process when a half-life of the selected positron emitter within the specimen being tested is less than the predetermined half-life, said data processing system, when operated in accordance with the rapid activation/analysis process, alternatively activating said photon source and detecting raw data indicative of a positron annihilation event." Because the prior art fails to disclose or suggest at least these limitations of claim 20, claim 20 is allowable.

Claim 21 is independently allowable in that the examiner failed to identify any objective

teachings in any of the references that disclose or suggest the additional limitations of claim 21 "wherein said data processing system includes a positron lifetime algorithm, said positron lifetime algorithm processing raw data indicative of a positron formation event to produce output data indicative of a changing presence or absence of a lattice defect."

Claim 22 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 22 "further comprising a second detector" and "wherein said data processing system includes a positron lifetime algorithm, said positron lifetime algorithm processing data indicative of a positron formation event to produce output data indicative of a changing presence or absence of a lattice defect."

Claim 23 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 23 "wherein said data processing system includes a selective activation algorithm, said selective activation algorithm responsive to a user input, said selective activation algorithm operating said photon source to produce photons having the predetermined energies in response to the user input."

Claim 24 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 24 "wherein said data processing system includes a three-dimensional imaging algorithm, said three-dimensional imaging algorithm processing raw data indicative of a positron annihilation event to produce output data indicative of a location of the presence or absence of a lattice defect."

Independent claim 26 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 26 "means for alternately activating the positron emitter within the specimen being tested

and detecting a positron annihilation event." Again, the prior art simply fails to disclose or even suggest such a means.

Claim 27 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 27 "wherein said data processing means process raw data indicative of the positron formation event in accordance with a positron lifetime algorithm to produce output data indicative of a changing presence or absence of a lattice defect."

Claim 28 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 28 "further comprising second detector means" and "wherein said data processing means processes raw data indicative of the positron formation event in accordance with a positron lifetime algorithm to produce output data indicative of a changing presence or absence of a lattice defect."

Claim 30 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 30 "wherein said means for alternately activating. . .comprises means for moving the specimen being tested between an activation position and a detection position."

Independent claim 31 is allowable for the same reasons expressed above for claim 20. That is, the examiner has failed to establish the required prima-facie case of obviousness of claim 31 by failing to identify any objective teaching in either Firestone or Akers that would lead a person having ordinary skill in the art to combine the references in the manner required by claim 31. The mere conclusory statements offered by the examiner are not enough. That is, the prior art fails to disclose or suggest the non-destructive testing apparatus of claim 31 comprising "a photon source for producing photons having a predetermined energy. . . the photons. . .resulting in the creation of positrons within the specimen. . ." as well as a "Doppler broadening processor"

that produces "output data indicative of the presence or absence of a lattice defect in the specimen being tested." Again, merely picking and choosing from among the prior art certain of these elements amounts to nothing more than hindsight reconstruction and cannot form the basis for a valid obviousness rejection under Section 103.

Claim 32 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 32 "further comprising three-dimensional imaging apparatus operatively associated with said detector and responsive to the raw data produced thereby, said three-dimensional imaging apparatus producing output data indicative of a location of the presence or absence of a lattice defect."

Claim 33 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 33 "further comprising a positron lifetime processor operatively associated with said detector and responsive to the raw data produced thereby, said positron lifetime processor producing output data. . .indicative of a changing presence or absence of a lattice defect."

Independent claim 34 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 34 "a positron lifetime processor operatively associated with said detector. . ., said positron lifetime processor producing output data. . . indicative of a changing presence or absence of a lattice defect." Simply finding these elements, or corollaries for these elements, cannot form the basis for an obviousness rejection under *In re Rouffet, supra*.

Claim 35 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 35 "further comprising three-dimensional imaging apparatus operatively associated with said

detector and responsive to the raw data produced thereby, said three-dimensional imaging apparatus producing output indicative of a location of the presence or absence of a lattice defect."

Independent claim 36 is allowable for the same reasons expressed above for claim 20. That is, the examiner has failed to establish the required prima-facie case of obviousness of claim 36 by failing to identify any objective teaching in either Firestone or Akers that would lead a person having ordinary skill in the art to combine the references in the manner required by claim 36. The mere conclusory statements offered by the examiner are not enough. That is, the prior art fails to disclose or suggest the non-destructive testing apparatus of claim 36 comprising "a photon source for producing photons having a predetermined energy. . . the photons. . .resulting in the creation of positrons within the specimen. . ." as well as a " data processing system" that includes a "Doppler broadening algorithm" that produces "output data indicative of the presence or absence of a lattice defect in the specimen being tested." Again, merely picking and choosing from among the prior art certain of these elements amounts to nothing more than hindsight reconstruction and cannot form the basis for a valid obviousness rejection under Section 103.

In addition, claim 36 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 36 wherein the data processing system includes "a positron lifetime algorithm. . .to produce output data indicative of a changing presence or absence of a lattice defect" and "a three-dimensional imaging algorithm. . .to produce output data indicative of a location of the presence or absence of a lattice defect."

CONCLUSION

The examiner failed to establish the required *prima-facie* case that the claims are not enabled under Section 112, first paragraph. With regard to the Section 112, second paragraph,

rejections, the claim term in question is used in the same manner in the specification and claims, and is sufficiently definite to a person having ordinary skill in the art, thus satisfying the requirements of Section 112, second paragraph. The examiner's obviousness rejections under Section 103 cannot stand as the examiner failed to establish the required *prima-facie* case of obviousness. Therefore, appellants respectfully request the Board to remove the rejections of claims 1-3, 5, 7, 8, 20-24, 26-28, and 30-36.

Respectfully submitted,

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APPENDIX A

1. Non-destructive testing apparatus, comprising:

a photon source, said photon source producing photons having a predetermined energy and directing the photons toward a specimen being tested, the photons from said photon source resulting in the creation of positrons within the specimen being tested;

a detector, said detector positioned adjacent the specimen being tested so that said detector detects gamma rays produced by annihilation of positrons with electrons; and

a data processing system operatively associated with said detector, said data processing system producing output data indicative of the presence or absence of a lattice defect in the specimen being tested.

2. The non-destructive testing apparatus of claim 1, wherein said photon source comprises a source of bremsstrahlung photons.

3. The non-destructive testing apparatus of claim 2, wherein said source of bremsstrahlung photons comprises:

an electron accelerator, said electron accelerator accelerating a stream of electrons to a predetermined energy; and

a target operatively associated with said electron generator, said target intercepting the stream of electrons from said electron accelerator and producing photons.

4. (Withdrawn from consideration) The non-destructive testing apparatus of claim 1, wherein said photon source comprises an isotopic photon source.

5. The non-destructive testing apparatus of claim 1, wherein said detector comprises a germanium detector.

6. (Canceled).

7. The non-destructive testing apparatus of claim 1, wherein said data processing system is operatively associated with said photon source, said data processing system operating said photon source to produce photons having the predetermined energies.

8. Non-destructive testing apparatus, comprising:

photon generating means for producing photons having predetermined energies and for directing the photons toward a specimen being tested, the photons from said photon generating means resulting in the creation of positrons within the specimen being tested;

detecting means for detecting gamma rays produced by annihilation of positrons with electrons within the specimen being tested and for producing an output indicative of a material characteristic of the specimen being tested; and

data processing means operatively associated with said detecting means for producing output data indicative of the presence or absence of a lattice defect in the specimen being tested.

9 -19. (Canceled)

20. Non-destructive testing apparatus, comprising:

a photon source, said photon source producing photons having a predetermined

energy and directing the photons toward a specimen being tested, the photons from said photon source resulting in the creation of positrons within the specimen being tested;

a detector positioned adjacent the specimen being tested, said detector producing raw data indicative of a positron annihilation event; and

a data processing system operatively associated with said detector and said photon source, said data processing system operating in accordance with a normal activation/analysis process when a half-life of a selected positron emitter within the specimen being tested is greater than a predetermined half-life, said data processing system operating in accordance with a rapid activation/analysis process when a half-life of the selected positron emitter within the specimen being tested is less than the predetermined half-life, said data processing system, when operated in accordance with the rapid activation/analysis process, alternatively activating said photon source and detecting raw data indicative of a positron annihilation event, said data processing system including a Doppler broadening algorithm, said Doppler broadening algorithm processing raw data indicative of a positron annihilation event to produce output data indicative of the presence or absence of a lattice defect in the specimen being tested.

21. The non-destructive testing apparatus of claim 20, wherein said detector produces raw data indicative of a positron formation event, and wherein said data processing system includes a positron lifetime algorithm, said positron lifetime algorithm processing raw data indicative of a positron formation event to produce output data indicative of a changing presence or absence of a lattice defect.

22. The non-destructive testing apparatus of claim 20, further comprising a second

detector positioned adjacent the specimen being tested, said second detector producing raw data indicative of a positron formation event, wherein said data processing system includes a positron lifetime algorithm, said positron lifetime algorithm processing data indicative of a positron formation event to produce output data indicative of a changing presence or absence of a lattice defect.

23. The non-destructive testing apparatus of claim 20, wherein said data processing system includes a selective activation algorithm, said selective activation algorithm responsive to a user input, said selective activation algorithm operating said photon source to produce photons having the predetermined energies in response to the user input.

24. The non-destructive testing apparatus of claim 20, wherein said data processing system includes a three-dimensional imaging algorithm, said three-dimensional imaging algorithm processing raw data indicative of a positron annihilation event to produce output data indicative of a location of the presence or absence of a lattice defect within the specimen being tested.

25. (Canceled)

26. Non-destructive testing apparatus, comprising:

positron activation means for activating a positron emitter within a specimen being tested;

detector means for detecting a positron annihilation event within the specimen being tested and for producing raw data indicative of the positron annihilation event;

means for alternately activating the positron emitter within the specimen being tested and detecting a positron annihilation event; and

data processing means operatively associated with said detector means, said data processing means processing raw data indicative of the positron annihilation event in accordance with a Doppler broadening algorithm to produce output data indicative of the presence or absence of a lattice defect in the specimen being tested.

27. The non-destructive testing apparatus of claim 26, wherein said detector means detects a positron formation event and a positron annihilation event and produces raw data indicative of the positron formation event and the positron annihilation event, and wherein said data processing means processes raw data indicative of the positron formation event in accordance with a positron lifetime algorithm to produce output data indicative of a changing presence or absence of a lattice defect.

28. The non-destructive testing apparatus of claim 26, further comprising second detector means for detecting a positron formation event and for producing raw data indicative of the positron formation event, wherein said data processing means processes raw data indicative of the positron formation event in accordance with a positron lifetime algorithm to produce output data indicative of a changing presence or absence of a lattice defect.

29. (Canceled)

30. The non-destructive testing apparatus of claim 26, wherein said means for alternately activating the positron emitter within the specimen being tested and detecting a positron

annihilation event comprises means for moving the specimen being tested between an activation position and a detection position.

31. Non-destructive testing apparatus, comprising:

a photon source, said photon source producing photons having a predetermined energy and directing the photons toward a specimen being tested, the photons from said photon source resulting in the creation of positrons within the specimen being tested;

a detector positioned adjacent the specimen being tested, said detector producing raw data related to a positron annihilation event; and

a Doppler broadening processor operatively associated with said detector and responsive to the raw data produced thereby, said Doppler broadening processor producing output data indicative of the presence or absence of a lattice defect in the specimen being tested.

32. The non-destructive testing apparatus of claim 31, further comprising three-dimensional imaging apparatus operatively associated with said detector and responsive to the raw data produced thereby, said three-dimensional imaging apparatus producing output data indicative of a location of the presence or absence of a lattice defect within the specimen being tested.

33. The non-destructive testing apparatus of claim 31, wherein said detector produces raw data that include data indicative of a positron formation event and data indicative of a positron annihilation event, said non-destructive testing apparatus further comprising a positron lifetime processor operatively associated with said detector and responsive to the raw data

produced thereby, said positron lifetime processor producing output data indicative of the presence or absence of a lattice defect of the specimen being tested and indicative of a changing presence or absence of a lattice defect.

34. Non-destructive testing apparatus, comprising:

a photon source, said photon source producing photons having a predetermined energy and directing the photons toward a specimen being tested, the photons from said photon source resulting in the creation of positrons within the specimen being tested;

a detector positioned adjacent the specimen being tested, said detector producing raw data indicative of a positron formation event and a positron annihilation event; and

a positron lifetime processor operatively associated with said detector and responsive to the raw data produced thereby, said positron lifetime processor producing output data indicative of a the presence or absence of a lattice defect in the specimen being tested and indicative of a changing presence or absence of a lattice defect.

35. The non-destructive testing apparatus of claim 34, further comprising three-dimensional imaging apparatus operatively associated with said detector and responsive to the raw data produced thereby, said three-dimensional imaging apparatus producing output data indicative of a location of the presence or absence of a lattice defect within the specimen being tested.

36. Non-destructive testing apparatus, comprising:

a photon source, said photon source producing photons having a predetermined energy and directing the photons toward a specimen being tested, the photons from said

photon source resulting in the creation of positrons within the specimen being tested;

a detector positioned adjacent the specimen being tested, said detector producing raw data indicative of a positron formation event and a positron annihilation event; and

a data processing system operatively associated with said detector, said data processing system including:

a Doppler broadening algorithm, said Doppler broadening algorithm processing raw data indicative of a positron annihilation event to produce output data indicative of a presence or absence of a lattice defect in the specimen being tested;

a positron lifetime algorithm, said positron lifetime algorithm processing raw data indicative of a positron formation event to produce output data indicative of a changing presence or absence of a lattice defect; and

a three-dimensional imaging algorithm, said three-dimensional imaging algorithm processing raw data indicative of a positron annihilation event to produce output data indicative of a location of the presence or absence of a lattice defect within the specimen being tested.

APPENDIX B

References Relied on By Examiner in his Final Response.

Copies of the following references are attached hereto for the Board's convenience:

1. Akers *et al.*, U.S. Patent No. 6,178,218, issued January 23, 2001, entitled "Nondestructive Examination Using Neutron Activated Positron Annihilation."

2. Firestone, Richard, B. "The Berkeley Laboratory Isotopes Project, Exploring the Table of Isotopes," May 22, 2000, pages 1 of 1, and pages 1, 2, and 3 of 4. No page 4 is provided.

APPENDIX C

Appeal Brief for U.S. Patent Application Serial No. 10/269,807, filed October 3, 2003, pages 19-27.

inappropriate process by which to determine patentability." *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed.Cir. 1996).

> To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed."

A reference which teaches away from the applicant's invention may not properly be used in framing a 35 U.S.C. §103 rejection of applicant's claims. See *United States v. Adams*, 148 USPQ 429 (1966).

The Examiner's Rejections

The examiner rejected claims 1, 11-17, 21-29, and 33-39 under 35 U.S.C. Section 103(a) as being "unpatentable over either of Pongratz et al. or Miller in view of Ales [sic, Alex] and further in view of applicant's own admission of prior art." The examiner's rejections are improper in that he never stated how Alex was to be applied. Therefore, the examiner has failed to establish the required *prima-facie* case of obviousness.

While the examiner's rejections appear to be substantive, in that he describes in great detail the devices disclosed in Pongratz and Miller, what the examiner failed to do was to point to some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the teachings of Pongratz, Miller, and Alex in the manner urged by the examiner. Of course, appellants have no idea how Alex would be applied, because the examiner nowhere even discussed Alex, much less met his burden of pointing out some objective teaching in Alex that could be used in some manner with Pongratz and Miller to make obvious the pending claims.

As the Court of Appeals for the Federal Circuit recently stated in *In re Lee*, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002) the examiner can satisfy the burden of showing obviousness "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." Because the examiner failed to satisfy this burden, the examiner failed to establish the required prima-facie case of obviousness.

As to the examiner's use of appellant's "own admission of prior art," appellant strenuously objects to the examiner's assertion in page 5 of the final office action that "applicant stated that a normal activation/analysis process and a rapid activation/analysis process are well known in the art." This is a blatant mis-representation of the statements contained in the referenced amendment. Appellant made no such statement. Neither the normal activation/analysis process nor the rapid activation/analysis process is prior art, and appellant specifically denies that they are prior art.

The amendment referred to by the examiner (attached hereto as a part of Appendix B) involves, in part, a rebuttal to Section 112 rejections made by the examiner in that case that the specification was insufficient as to what exactly is meant by the term "activation/analysis." In responding, appellant pointed out the many and various sections in the application (both specification and drawings) where the processes are described in sufficient detail to allow a person having ordinary skill in the art to practice the invention without undue experimentation. Appellant stated that no line-by-line recitation of computer code that might be written to perform the processes was included, but that the level of ordinary skill in the art was sufficiently high so as not to require such a level of disclosure. This is by no means an admission that the processes themselves are prior art. Appellant specifically refers the Board to the highlighted sections contained in pages 8, line 10 through page 13, line 3 of appellant's remarks in the related case,

serial no. 09/932,531, attached hereto as part of Appendix B.

In conclusion, claim 1 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the various method steps and limitations contained in claim 1.

Claim 11 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the various method steps and limitations contained in claim 11.

Claim 12 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 12 "wherein the selected half-life is on the order of tens of seconds."

Claim 13 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 13 "wherein the selected half-life is about 17 seconds."

Claim 14 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest that "the detection time is about equal to the half-life of the selected positron emitter."

Claim 15 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 15 "wherein the rapid activation/analysis process further comprises alternately moving the specimen between an activation position and a detection position, the activation position being adjacent a photon source, the detection position being adjacent a detector."

Claim 16 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the various additional limitations of claim 16 "wherein the rapid activation/analysis process further comprises alternately moving a

photon source adjacent the specimen during the activation time and away from the specimen during the detection time and alternately moving a detector adjacent the specimen during the detection time and away from the specimen during the activation time."

Claim 17 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitations of claim 17 "wherein the rapid activation/analysis process further comprises activating a photon source to bombard the specimen with photons during the activation time and de-activating the photon source during the detection time."

Claim 21 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 21 "wherein the selected half-life is on the order of tens of seconds."

Claim 22 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 22 "wherein the selected half-life is about 17 seconds."

Claim 23 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest that "the detection time is about equal to the half-life of the at least one positron emitter."

Claim 24 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 24 "alternately moving the specimen between an activation position and a detection position, the activation position being adjacent a photon source, the detection position being adjacent a detector."

Claim 25 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 25

"alternately moving a photon source adjacent the specimen during the activation time and away from the specimen during the detection time."

Claim 26 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 26 "alternately moving a detector adjacent the specimen during the detection time and away from the specimen during the activation time."

Claim 27 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 27 "activating a photon source to bombard the specimen with photons during the activation time and de-activating the photon source during the detection time."

Claim 28 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the various method steps and limitations contained in claim 28.

Claim 29 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 29 "wherein said activating the at least one positron emitter comprises activating for an activation time the at least one positron emitter by bombarding the specimen with photons having energies greater than the threshold energy."

Claim 33 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 33 "wherein the selected half-life is on the order of tens of seconds."

Claim 34 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the limitation of claim 34 "wherein the selected half-life is about 17 seconds."

Claim 35 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest "wherein detecting gamma rays is performed for a time that is about equal to the half-life of the at least one positron emitter."

Claim 36 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 36 "alternately moving the specimen between an activation position and a detection position, the activation position being adjacent a photon source, the detection position being adjacent a detector."

Claim 37 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 37 "alternately moving a photon source adjacent the specimen during the activation time and away from the specimen during the step of detecting gamma rays."

Claim 38 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 38 "alternately moving a detector adjacent the specimen during the step of detecting gamma rays and away from the specimen during the activation time."

Claim 39 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 39 "activating a photon source to bombard the specimen with photons during the activation time and de-activating the photon source during the step of detecting gamma rays."

ISSUE 4: Whether claims 8-10, 18-20, and 30-32 are unpatentable under 35 U.S.C. §103(a).

The Examiner's Rejections

The examiner rejected claims 8-10, 18-20, and 30-32 under 35 U.S.C. Section 103(a) as being "unpatentable over either of Pongratz et al., or Miller in combination with admitted prior art, as applied to claims 1, 11-17, 21-29, and 33-39 above, and further in view of additional admitted prior art."

These rejections are improper because they also fail to set forth how Alex is applied. While the rejections do not specifically mention Alex, they do so by implication. That is, the examiner specifically states that Pongratz and Miller are to be applied as they were to claims 1, 11-17, 21-29, and 33-39. However, those claims were rejected in view of Alex (even though the examiner failed to recite how Alex might be applied). Therefore, appellant is left to wonder how Alex fits in to these rejections, if at all. Of course, if Alex does not fit-in, then the examiner must clarify how Pongratz and Miller are to be applied to these rejections, as they cannot be applied in the same way as for the first set of claims rejected, because, under this assumption, Alex is not to be applied.

The examiner's failure to specify how Alex is to be applied, if at all, is fatal to the examiner's rejections of claims 8-10, 18-20, and 30-32. That is, the examiner has clearly failed to meet his burden of proof to establish a *prima-facie* case of obviousness. Therefore, claims 8-10, 18-20, and 30-32 are presumed to be allowable.

Appellant also traverses the examiner's assertions that the prior art (i.e., the positron lifetime algorithm, the Doppler broadening algorithm, and the three-dimensional imaging algorithm) admitted by appellant is sufficient to support an obviousness rejection. While these algorithms are indeed known in the art, it is not known to apply the processes in combination with

the other elements of the pending claims. That knowledge stems from the present application which, of course, is not prior art. In other words, in making this statement, the examiner is improperly using the appellant's own teachings as a blueprint to piece together prior art elements in the manner required by the pending claims. This use is improper and cannot be used to sustain an obviousness rejection under Section 103. As the Court of Appeals for the Federal Circuit stated in *In re Rouffet, supra*:

> ". . .rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." [citations omitted].

In summation, claim 8 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 8 "determining a positron lifetime based on the detected gamma rays."

Claim 9 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 9 "using a Doppler broadening algorithm to determine at least one material characteristic."

Claim 10 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 10 "using a three dimensional imaging algorithm to determine a position within the specimen of a positron/electron annihilation event."

Claim 18 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 18 "determining a positron lifetime based on the detected gamma rays."

Claim 19 is independently allowable in that the examiner failed to identify any objective

teachings in any of the references that disclose or suggest the additional limitation of claim 19 "using a Doppler broadening algorithm to determine at least one material characteristic."

Claim 20 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 20 "using a three dimensional imaging algorithm to determine a position within the specimen of a positron/electron annihilation event."

Claim 30 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 30 "determining a positron lifetime based on the detected gamma rays."

Claim 31 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 31 "using a Doppler broadening algorithm to determine at least one material characteristic."

Claim 32 is independently allowable in that the examiner failed to identify any objective teachings in any of the references that disclose or suggest the additional limitation of claim 32 "using a three dimensional imaging algorithm to determine a position within the specimen of a positron/electron annihilation event.".

CONCLUSION

The examiner failed to establish the required *prima-facie* case that the claims are not enabled under Section 112, first paragraph. With regard to the Section 112, second paragraph, rejections, the claim term in question is used in the same manner in the specification and claims, and is sufficiently definite to a person having ordinary skill in the art, thus satisfying the requirements of Section 112, second paragraph. The examiner's obviousness rejections under Section 103 cannot stand as the examiner failed to establish the required *prima-facie* case of

APPENDIX D

Answer for U.S. Patent Application Serial No. 10/269,807, dated December 1, 2003, page 2.

(3) ***Status of Claims***

The statement of the status of the claims contained in the brief is correct.

(4) ***Status of Amendments After Final***

No amendment after final has been filed.

(5) ***Summary of Invention***

The summary of invention contained in the brief is correct.

(6) ***Issues***

The appellant's statement of issues is partially correct. The following issues are withdrawn:

a. Whether claims 1, 11-17, 21-29 and 33-39 are unpatentable under 35 U.S.C. 103(a) as being obvious over either of Pongratz et al. (U.S. 5,175,756) or Miller (U.S. 4,980,901) in view of Alex et al. (U.S. 4,064,438) and further in view of appellant's own admission of prior art. (The Examiner notes that inclusion of Alex et al. was a typographical error, and this reference was not applied in the rejection of claims).

b. Whether claims 8-10, 18-20 and 30-32 are unpatentable under U.S.C. 103(a) as being obvious over either of Pongratz et al. or Miller in combination with admitted prior art.

Appellant's brief presents arguments relating to his request for reconsideration of the finality of the Examiner's Office Action. This issue relates to petitionable subject matter under 37 CFR 1.181 and not to appealable subject matter. See MPEP § 1002 and § 1201.

APPENDIX E

Preliminary Amendment for U.S. Patent Application Serial No. 09/932,531, dated April 21, 2003, pages 8-15.

failed to meet is burden of proof as to why the disclosure is insufficient.

The examiner's objections to the specification and rejections of the claims are based on erroneous remarks about what the specification fails to teach. The objections and rejections also appear to be based on a failure to review the entire specification. For convenience, the remarks presented by the examiner are addressed herein in the order presented in section 2 of the office action.

Remark 1:

By reference to page 8 of the specification, the examiner contends that the specification is insufficient as to what exactly is meant by the term "activation/analysis" as it appears in the names of the various processes set forth in the application and claims. While the examiner correctly states that these processes are presented in Figures 3 and 4 with no description of the internals thereof, the examiner makes no mention of the detailed descriptions of these processes that are provided in the specification at places other than page 8. For example, the normal activation/analysis process 38 is discussed in paragraphs 0049-0050 on pages 24 and 25. The rapid activation/analysis process 40 is discussed in paragraphs 0051-0054 on pages 25-27.

Specifically, paragraphs 0049-0050, which describe the normal activation/analysis process 38, are as follows:

> "The normal activation/analysis process 38 is best seen in Figure 3. The first step 42 in the normal activation/analysis process 38 involves activating the positron emitter (i.e., the isotope or isotopes identified in step 32). In one preferred embodiment, the positron emitter is activated by bombarding the specimen 18 with photons 16 from the photon source 12 having energies sufficient to activate the selected positron emitter or emitters, as the case may be. As mentioned above, photons having energies in the range of about 8 MeV to about 22 MeV

will activate most of the isotopes (i.e., positron emitters) likely to be found in many common materials. See, for example, Tables I and II. Alternatively, of course, photons having energies either above or below this range may be used, depending on the particular isotope and on the particular material characteristics to be detected. In the example involving chromium-49, the photons 16 produced by the photon source 12 should have energies of at least 20.5 MeV.

The photon-activated positron emitters result in the production of positrons within the specimen 18. Such positrons diffuse or migrate through the material comprising specimen 18 and tend to be attracted to voids or other lattice defects having a favorable electronic potential. Ultimately, a significant number of the positrons produced by the positron emitter or emitters will annihilate with electrons, resulting in the formation of gamma rays 20. Such gamma rays 20 are detected in step 44 by the detector 14, which produces raw data 22. The raw data 22 are then analyzed in step 46 to produce output data 26 indicative of at least one material characteristic of the specimen 18. The output data 26 may be displayed in suitable form on the display system 28. See Figure 1."

Clearly, the normal activation/analysis process 38 is sufficiently described in the specification, especially when considered in light of the factors listed in MPEP 2164.01(a) identified above. That is, the nature of the invention, the state of the prior art, and the level of one of ordinary skill in the art are such that the description provided in the specification is more than sufficient to all a person having ordinary skill in the art to practice the invention without undue experimentation. The state of the prior art in this field is well-developed, as evidenced by the prior art of record in this application. The level of one of ordinary skill in the art is also high, and certainly does not require a detailed, line-by-line recitation of computer code that may be required to perform the normal activation/analysis process 38. Stated another way, while some experimentation might be required to settle upon an optimum arrangement for a particular application, such

experimentation is allowable in that it would not be "undue."

In addition, and to address the specific concern of the examiner, the description also clearly explains that the normal activation/analysis process 38 involves both the activation of the positron emitters as well as an analysis of the raw data 22 collected by the detector.

Turning now to the rapid activation/analysis process 40, paragraphs 0051-0054 of the present application describe the rapid activation/analysis process 40 as follows:

> "If the half life of the isotope or positron emitter to be activated is less than a few tens of seconds, as determined in step 36, the method 30 executes the rapid activation/analysis process 40. With reference now to Figure 4, the rapid activation/analysis process 40 involves alternate photon bombardment and subsequent gamma ray detection of the specimen 18. More specifically, the specimen 18 is first exposed to the photons 16 from the photon source 12 for a selected time at step 48. Then, gamma rays 20 resulting from the annihilation of positrons with electrons are detected via detector 14 at step 50. If a sufficient number of gamma rays 20 have been detected, as determined in step 53, the method 30 proceeds to step 54 wherein the data are analyzed to produce output data 26 (Figure 1) that are indicative of at least one material characteristic of the specimen 18. The output data 26 may be displayed in suitable form on the display system 28. Alternatively, if an adequate number of gamma rays 20 have not been detected, the method 30 returns to step 48 wherein the specimen 18 is again exposed to photons 16 from the photon source 12 for a selected time. This rapid activation/analysis process 40 is repeated until a sufficient number of gamma rays 20 have been detected.
>
> The alternate photon activation and detection steps 48 and 50, respectively, may be accomplished in a variety of ways. For example, with reference now to Figure 5, the specimen 18 could be alternately moved between an activation position 56 and a detection position 58. A suitable mechanical arrangement (not shown) may be provided to move the specimen 18 between the activation position 56 and the detection position 58. Alternatively, of course, the specimen 18 could remain stationary while the photon source 12 and

detector 14 are moved. Again, a suitable arrangement for so moving the photon source 12 and detector 14 could be easily arrived at by persons having ordinary skill in the art after having become familiar with the teachings of the present invention.

Regardless of the particular arrangement for moving the specimen 18 between the activation position 56 and the detection position 58 (or for moving the photon source 12 and detector 14), the specimen 18, while in the activation position 56, is positioned adjacent the photon source 12 so that the specimen 18 receives photons 16 therefrom. Then, after having been exposed to the photons 16 for the selected time, the specimen 18 is moved to the detection position 58. While in the detection position 58, the detector 14 detects gamma rays 20 emitted from the specimen 18 as a result of positron/electron annihilations. The times in which the specimen 18 is located in the activation position 56 and in the detection position 58 will vary depending on the particular positron emitter or emitters involved and on the particular material characteristics to be studied. However, the time during which the specimen 18 remains in the activation position 56 should be sufficient to activate a sufficient number of positron emitters so that the gamma rays 20 resulting from positron/electron annihilations will be detectable by the detector 14. Similarly, the specimen 18 should remain in the detection position 58 for a time sufficient to detect gamma rays 20 resulting from annihilation events. Generally speaking, the time that the specimen 18 should remain in the detection position 58 should be at least equal to one half-life of the activated positron emitter or emitters, although the time could be longer or shorter than the half-life. In consideration of these matters, then, the present invention should not be regarded as limited to any particular times for each position.

As was briefly mentioned above, other arrangements are possible for alternately activating the positron emitters then detecting the gamma rays 20 resulting from annihilation events. For example, in another arrangement, the photon source 12 is alternately energized for the activation time period, then de-energized for a detection time period in which gamma rays 20 emitted from the specimen 18 are detected by the detector 14. Again, the activation time period should be set so as to activate a sufficient quantity of positron emitters, whereas the detection time period should encompass at least one

half-life of the activated positron emitter or emitters."

Again, in making his objections and rejections, the examiner looks only to the drawings and, apparently, only page 8 of the specification. However, those portions of the specification that describe the rapid activation/analysis process 40 in detail make clear that the rapid activation/analysis process 40 is sufficiently described in the specification, particularly when considered in light of the factors listed in MPEP 2164.01(a) identified above. That is, the nature of the invention, the state of the prior art, and the level of one of ordinary skill in the art are such that the description provided in the specification is more than sufficient to all a person having ordinary skill in the art to practice the invention without undue experimentation. To repeat, the state of the prior art in this field is well-developed, as evidenced by the prior art of record in this application. The level of one of ordinary skill in the art is also high, and certainly does not require a detailed, line-by-line recitation of computer code that may be required to perform the rapid activation/analysis process 38 considering that the specification describes in detail the steps that are to be performed by the process 40. Stated another way, while some experimentation might be required to settle upon an optimum arrangement for a particular application, such experimentation is allowable in that it would not be "undue."

The description also makes clear that the rapid activation/analysis process 40 involves both the activation of the positron emitter or emitters as well as the analysis of the raw data 22 collected by the detector 14.

In addition, applicant notes that it is well-established law that the applicant may be his own lexicographer. Applicant coined the terms "normal activation/analysis" to describe the process 38 and "rapid activation/analysis" to describe the process 40. As used in the specification, and as explained

above, these terms are not repugnant to the normal meanings of the terms taken separately, thus are acceptable for use in the patent application.

Remark 2:

The examiner states that the specification fails to state the criteria for determining whether the data collected is sufficient or insufficient.

While it is true that no specific times or quantities are recited in the specification, persons having ordinary skill in the art, after having become familiar with the teachings contained in the specification, could readily ascertain when "sufficient" data have been collected. Indeed, the specification acknowledges this fact in paragraph 0053 which states, in part:

> "The times in which the specimen 18 is located in the activation position 56 and in the detection position 58 **will vary depending on the particular positron emitter or emitters involved and on the particular material characteristics to be studied.** However, the time during which the specimen 18 remains in the activation position 56 should be sufficient to activate a sufficient number of positron emitters so that the gamma rays 20 resulting from the positron/electron annihilations will be detectable by the detector 14. Similarly, the specimen 18 should remain in the detection position 58 for a time sufficient to detect gamma rays 20 resulting from annihilation events. **Generally speaking, the time that the specimen 18 should remain in the detection position 58 should be at least equal to one half-life of the activated positron emitter or emitters, although the time could be longer or shorter than the half-life. In consideration of these matters, then, the present invention should not be regarded as limited to any particular times for each position.**" (emphasis added)

Stated simply, the nature of the invention precludes a "one size fits all" approach to this issue, i.e., when "sufficient" data have been collected. This fact is brought-out in the specification and would be known to persons having ordinary skill

in the art. Thus, when read in light of the specification, the term "sufficient," as used in the claims, serves to reasonably describe the subject matter of the invention and to allow its scope to be understood by persons in the field of the invention to a degree sufficient to distinguish the claimed subject matter from the prior art. Accordingly, the term "sufficient," as used in the pending claims, is not indefinite.

Remark 3:

The examiner states that the Doppler broadening algorithm 62, the positron lifetime algorithm 64, the 3-D imaging algorithm 66, and the selective activation algorithm 68 are not sufficiently described. While the examiner correctly states that these processes are presented in Figures 3 and 4 with no description of the internals thereof, the examiner again fails to acknowledge those portions of the detailed description wherein these algorithms are described at length.

For example, the Doppler broadening algorithm 62 is described in paragraphs 0028, 0055, and 0056. The positron lifetime algorithm 64 is described in paragraphs 0028, 0055, and 0057. The 3-D imaging algorithm 66 is described in paragraphs 0028, 0055, 0058, and 0059. Applicant also noted in the specification that the various techniques utilized by these algorithms are well-known in the art and could be easily provided by persons having ordinary skill in the art. In addition, the paper entitled "Positron Annihilation Spectroscopy" which was published in vol. 14 of the Encyclopedia of Applied Physics in 1996 (and cited by the applicant in the Information Disclosure Statement) includes descriptions of these types of algorithms, demonstrating that they are known in the art. It is well-established that the law does not require, and indeed prefers, that an applicant omit from the specification that which is well-known. In re Buchner, supra.

The selective activation algorithm 68 is described in paragraphs 0030 and 0060, of which paragraph 0060 is reproduced

below.

> "For each analysis algorithm, e.g., 62, 64, and 66, described above the data processing system 60 may utilize a selective activation algorithm 68. The selective activation algorithm 68 allows certain isotopes or positron emitters in the specimen 18 to be activated. The selective activation algorithm 68 is responsive to input from the user regarding either the particular positron emitter or emitters to be activated or the desired photon energy. The selective activation algorithm 68 then controls or operates the photon source 12 as necessary to produce photons 16 having energy levels suitable for activating the selected positron emitter or emitters. The selective activation algorithm 68 allows the user to activate certain of the isotopes or positron emitters comprising the specimen 18."

Stated simply, the selective activation algorithm causes the data processing system to set the energy level of the photons produced by the photon source. This allows the user to activate certain of the isotopes or positron emitters in the specimen. It is sufficiently described to allow a person having ordinary skill in the art to practice the invention without undue experimentation. That is, the nature of the invention, the state of the prior art, and the level of one of ordinary skill in the art are such that the description provided in the specification is more than sufficient to all a person having ordinary skill in the art to practice the invention without undue experimentation. Again, applicant notes that the state of the prior art in this field is well-developed, as evidenced by the prior art of record in this application. The level of one of ordinary skill in the art is also high, and certainly does not require a detailed, line-by-line recitation of computer code that may be required to perform the selective activation algorithm 68. Stated another way, while some experimentation might be required to settle upon an optimum arrangement for a particular application, such experimentation is allowable in that it would not be "undue."